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Relativistic Heavy Ion Collider
Magnet Division Procedure

Proc. No.: RHIC-MAG-R-7227

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Class: Electrical Testing

Title: RHIC Electrical Resistance Measurement for Individual Coils

- Prepared by: Signature on File
- Cognizant Engineer/Scientist: Signature on File
- Electrical Systems Section: Signature on File
- Q. A. Approval: Signature on File
- ES&H Review: Signature on File

REVISION RECORD

Rev. No.	Date	Page	Subject	Approval	QA	ES&H
A	4/13/90	Title,	Changed title to include			
		1	quadrupole. Section 4.2.1 -			
			Added quadrupole typical			
			values.	On File		
B	5/15/92	1	Revised values of R for Dipole			
			/Quadrupole to agree with			
			Specification 7401	On File		
C	3/16/93		Revised specification as per	On File	On File	On File
			SCR #465			

1 Scope:

This procedure describes the method for measuring electrical resistance across a magnet coil by measuring voltage drop with a 1.0 amp DC current applied through the coil. Some magnet coils require using a current source of 0.1 or 0.01 ampere because of their higher resistance.

2 Applicable Documents:

Data Sheet -	RHIC Electrical Resistance Measurement for Individual Coils
RHIC-MAG-Q-1000 -	Magnet Division Procedure for Control of Measurement and Test Equipment
RHIC-MAG-Q-1004 -	Discrepancy Reporting Procedure

3 Requirements:

3.1 Equipment Required:

3.1.1 Digital multimeter with 0.01 mV (10 μ V) resolution.

3.1.2 DC constant current source, 1.0, 0.1, or 0.01 ampere, isolated from ground.

3.1.3 Surface probe thermometer capable of reading to $\pm 0.1^{\circ}\text{C}$. @ room temperature.

3.2 Safety Precautions:

3.2.1 The technicians shall be qualified by their cognizant technical supervisor in the operation of the required test equipment and these electrical testing procedures. They shall be familiar with the latest revision of the applicable documents referenced in section 2. In addition, some of these tests require the technician to have special training. A list of qualified personnel shall be maintained with the RHIC ES & H Coordinator and the RHIC Training Coordinator.

3.2.2 Some of these electrical test procedures have specific safety requirements. The technicians performing these specific tests shall rigorously follow all the safety requirements listed as well as those prescribed by the BNL ES & H Standard.

3.3 Procedure:

3.3.1 Record coil temperature with a surface probe thermometer.

3.3.2 Connect the power supply to the two leads of the coil under test. Apply a constant current of 1.0 (0.1, 0.01) amp DC through the coil. Record the voltage drop across the coil. Fill out the attached data sheet. Typical values for RHIC magnet coil(s) are shown below.

3.3.3 Arc Dipole Magnet, 8 cm, 9.45 Meter.

- a) $1.60\ \Omega$ for an individual dipole coil
- b) $3.20\ \Omega$ for (2) series connected dipole coils

3.3.4 Arc Quadrupole Magnet, 8 cm, 1.13 Meter.

- a) $0.095\ \Omega$ for individual quadrupole coil
- b) $0.380\ \Omega$ for (4) series connected quad coils

3.3.5 Insertion Quadrupole Magnet, 13 cm, 1.44 Meter.

- a) $0.1842\ \Omega$ for individual quadrupole coil
- b) $0.7367\ \Omega$ for (4) series connected quad coils

3.3.6 Corrector Magnet, 8 cm, 0.5 Meter.

Note: use current of 0.01 amperes.

- a) $436\ \Omega$ for dipole, B0, coil
- b) $123\ \Omega$ for quadrupole, B1, coil
- c) $102\ \Omega$ for octupole, B3, coil
- d) $94\ \Omega$ for decapole, B4, coil

3.3.7 Sextupole Magnet, 8 cm, 0.75 Meter.

Note: use current of 0.1 amperes.

- a) $36.1\ \Omega$ for an individual sextupole coil
- b) $227.5\ \Omega$ for (6) series connected sextupole coils

4 Quality Assurance Provisions:

4.1 The quality assurance provisions of this procedure requires that the technician shall be responsible for performing all inspections and tests in compliance with the procedural instructions contained herein and the recording of test results on the data sheet(s) and/or on the production traveler.

4.2 The technician is responsible for verifying that the test and measurement equipment used in this procedure has been calibrated and that the calibration sticker (date) has not expired as per RHIC-MAG-Q-1000.

4.3 The technician is responsible for notifying the technical supervisor and/or the cognizant engineer of any discrepancies occurring during the performance of this procedure. All discrepancies shall be identified and reported as per RHIC-MAG-Q-1004.

5 Preparation for Delivery:

N/A

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DATA SHEET

RHIC Electrical Resistance Measurement for Individual Coils

Magnet/Coil type, aperture, and length: _____
(example: Arc Quadrupole, 8 cm, 1.13 Meter)

Magnet No.: _____ Coil Temp.: _____ °C

Coil Serial No.: _____

Coil Voltage Drop: _____ volts @ _____ amperes.

Comments: _____

Above work done by: _____

Name, Life No., Date

List of Equipment Used for Measurements

Nomenclature	Manufacturer	Model	Serial No.	BNL Bar Code
Remarks: _____				